

SMART SWITCH TECHNOLOGIES



TM-4000 Tank Monitor/Controller Installation Manual

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Electrical Specifications TM-4000

Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.03 Amps
Data Retention	50 years (without power)

Electrical Specifications HT-100

Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.024 Amps
High Relay Load	3 amps Inductive

Electrical Specifications HT-100/P

Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.024 Amps
High Relay Load	3 amps Inductive
Pump Output	88 amps

Network (RS-485)

The cable connecting the Master Display Unit to the Input/Output Unit is referred to as the network cable and may run up to 1000 meters in total length.

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TM-4000 Tank Monitor System

Introduction

Thank you for purchasing the TM-4000 Tank Monitor System. SS Technologies is very proud to be able to provide this product to you. You have selected a capable system designed to provide years of reliable service under the most demanding conditions.

SS Technologies is a pioneer in the design and development of distributable intelligence controller systems for the marine industry. The TM-4000 Tank Monitor System is a versatile, compact, modern, stylish, user-friendly intelligent network system. Our Research and Development Team have developed this system specifically for the marine environment using proven techniques and materials, which will ensure a long life at sea.

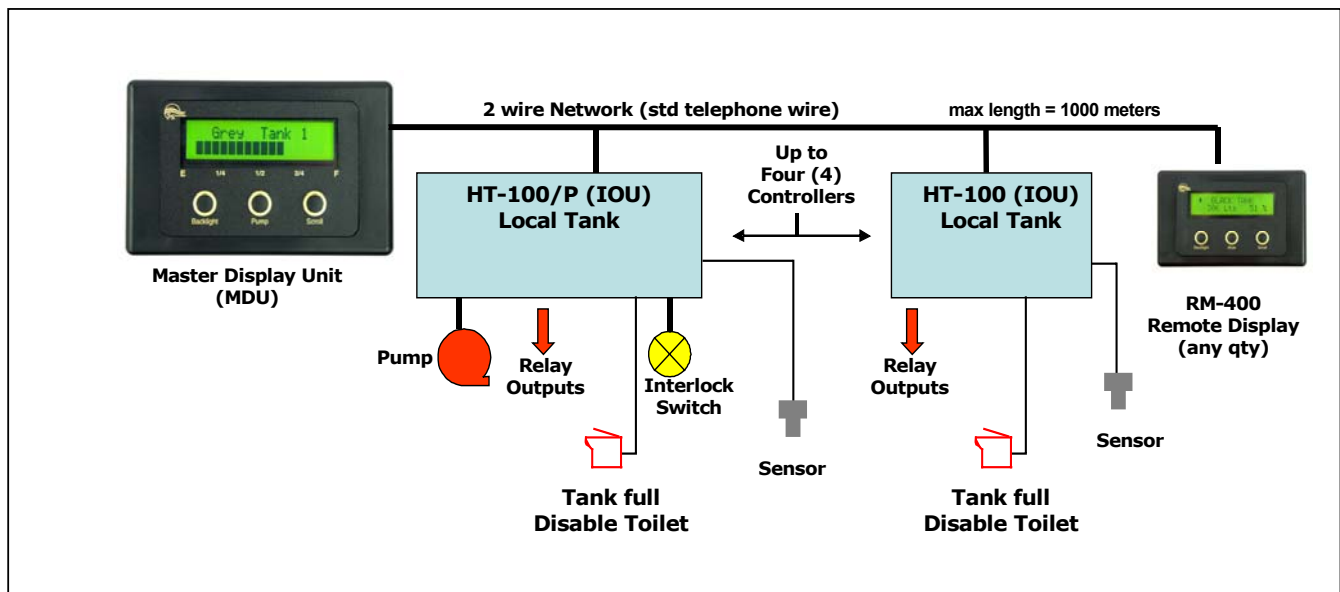
The TM-4000 allows builders and retrofitters to offer a system with maximum functionality thereby providing boat owners with excellent visibility of all tanks.

System Overview

The TM-4000 Tank Monitor System has been developed to allow monitoring of fluid levels and to provide intelligent intervention for controlling pumps in up to 4 tanks. It is a network system, consisting of the TM-4000 Master Display Unit (MDU) and up to 4 Input/Output Units (IOU). In addition, and as an option, any number of RM-400 Remote Display Units (RDU) may be added to provide tank status displays throughout the vessel.

A 2-wire network cable similar to that used for telephone installations interconnects all devices. The Master Display Unit (MDU) controls communication with all attached I/O Units (IOU) and provides monitoring of tank levels, interlock valve status and pumps status as well as pump control - all from a central location. System components may be located anywhere on the network cable and the cable may be up to 1000 meters in length.

These features, unique to the TM-4000, provide boat builders and retrofitters maximum flexibility in locating components onboard the vessel while minimizing wiring costs.



TM-4000 Master Display Unit (MDU)

Provides the following functions:

- full control from one central location on your boat
- visual indication of tank level (bar graph or lts / gals & percentage)
- visual indication of seacock position & pump status
- turn holding tank macerator pump on & off manually
- turn holding tank macerator pump on manually & off automatically
- turn water maker on manually & off manually or automatically
- all tanks are name programmable
e.g. (Aft-Grey) (Centre-Black) (Port Fuel) (Stb/Fuel)
- backlight
- audible alarm

RM-400 Remote Display Unit (RDU)

The RM-400 Repeater Display is an optional extra.

Any number of these may be connected anywhere on the vessel for convenient tank monitoring.

HT-100/P or HT-100 Input/Output Unit:

Is a controller which manages the tank pump, tank high output and provides an input for the fluid level sensor.

Features include:

- teach-in for level sensor with four point interpolation for irregular shaped tanks
- controls the pump and provides the input for the level sensor
- reversed output for tanks programmed as either fresh water or fuel, enabling for water maker or fuel transfer pumps to turn on when empty and off when full
- tank high level output which can be connected to the Aus/Sea toilet controller which disables the toilet when the holding tank is full
- an internal pump on/off override switch for tank servicing and cleaning
- supplied in two different models:
HT-100/P features level sensor, tank high output, pump & electric seacock control
HT-100 features level sensor and tank high output

Installation Steps

Step 1:

Install and connect the Master Display unit (MDU).

Step 2:

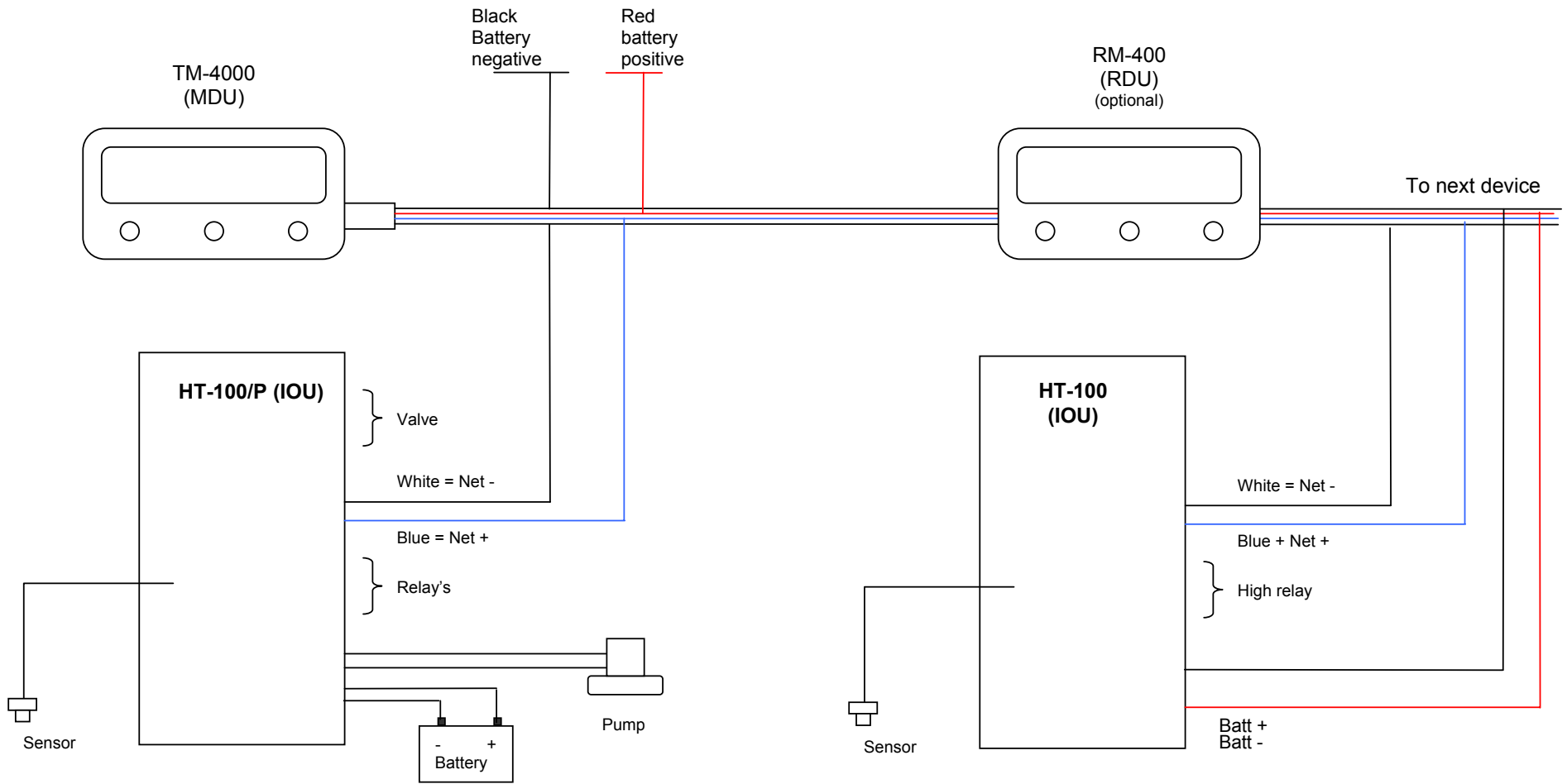
Install and connect the tank sensors.

Step 3:

Install and connect the I/O units (IOU).

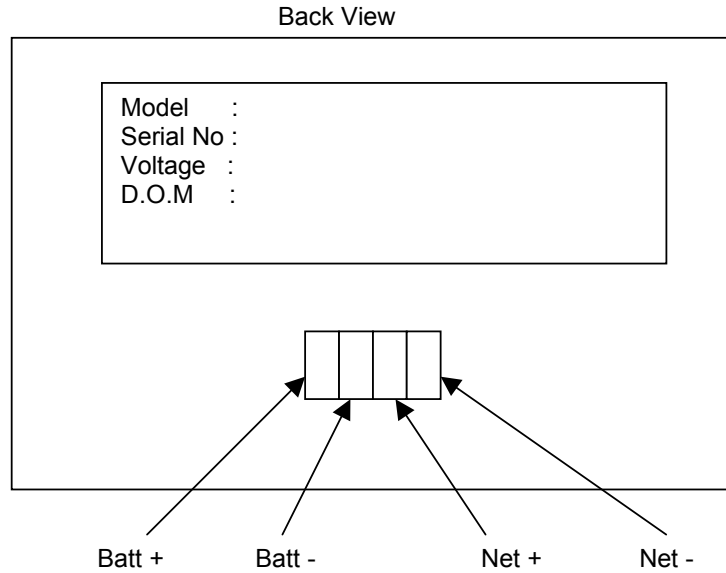
Step 4:

Set-up Rotary Switches

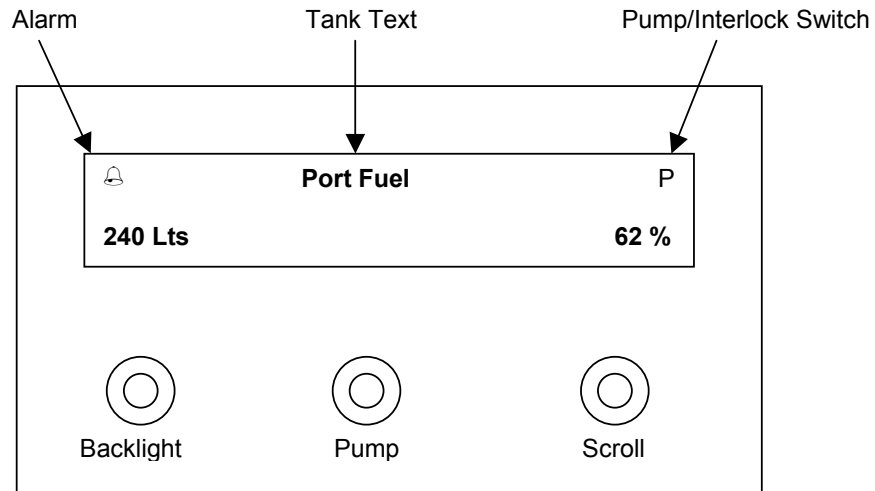


WARNING: As the HT-100/P supplies power for the pump, the supply and cables & fuse need be rated as per the pump manufacturers specifications.

Wiring Diagram for TM-4000 (MDU)



Display Functions



This system has two display modes see point 3, Operating Instructions page 13 to change.
Note 1: The Lts/Gal & Percentage will ONLY work with HT-100/P & HT-100 with a manufacture date from 1st July 2007.

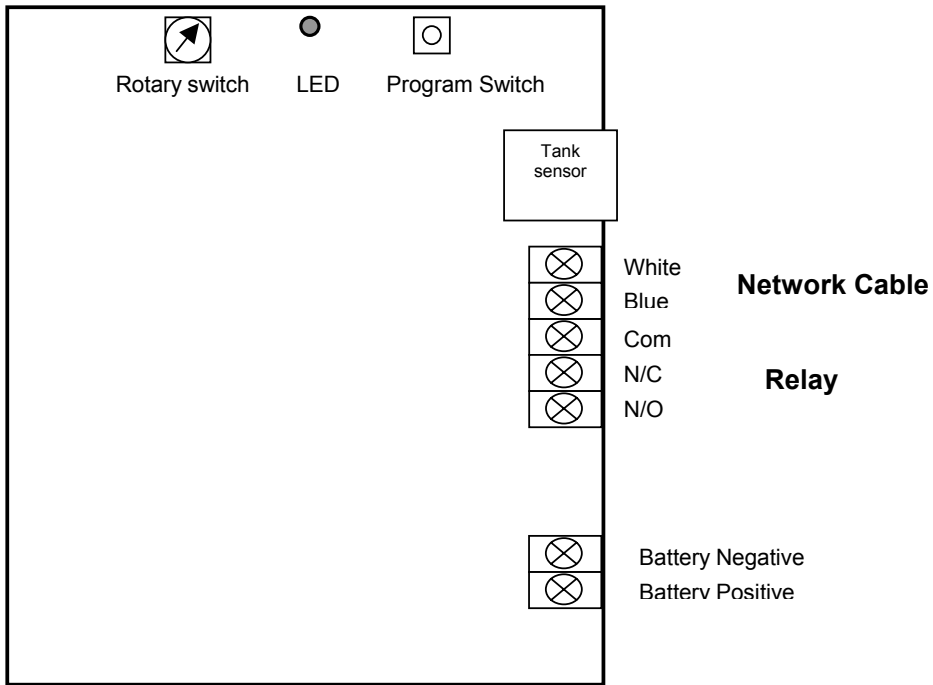
Display Mode 1



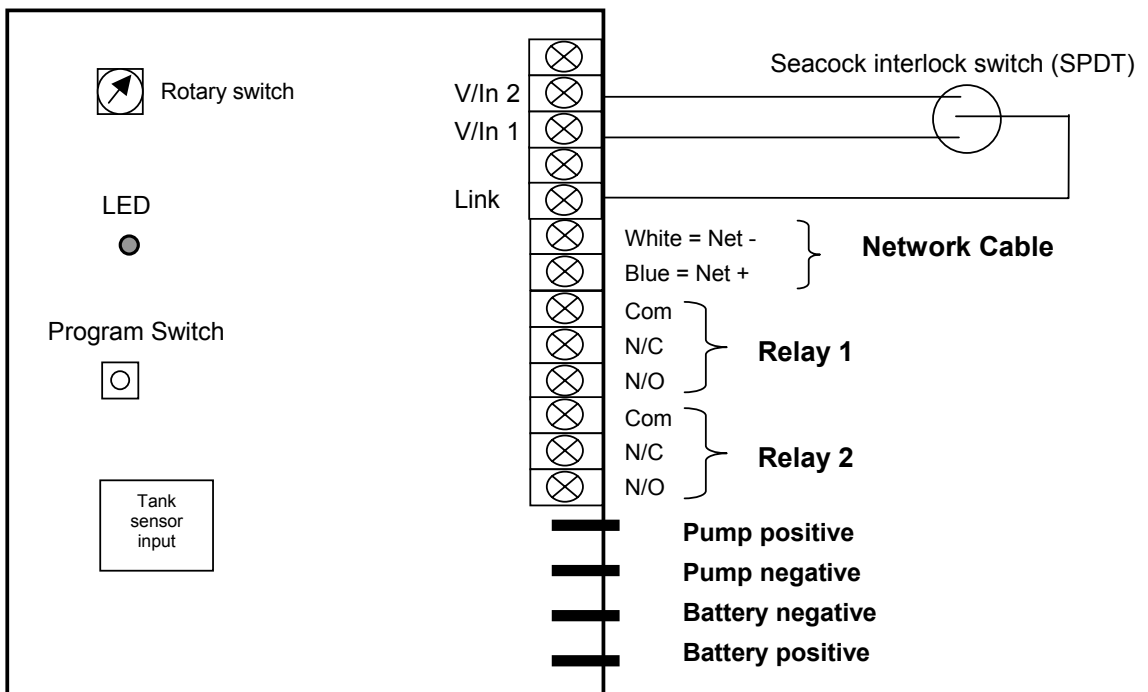
Display Mode 2



Wiring Diagram for HT-100



Wiring Diagram for HT-100/P (IOU)



If NO Interlock switch is fitted: Place a link wire between the Link & V/In 1 terminals.

If an interlock switch is fitted then wire as above. When the seacock **valve** is in the open position the **switch** needs to be in the closed position.

Sensor Installation

! WARNING !

PLEASE NOTE: For sensor Model SEN-100 The Maximum Tank Height is 1 Meter

PLEASE NOTE: For sensor Model SEN-250 The Maximum Tank Height is 2.5 Meter

The maximum surge and safe pressure is 28psi.

For more information see "Calibration Tips & Tricks" on our web site www.smartswitch.co.nz

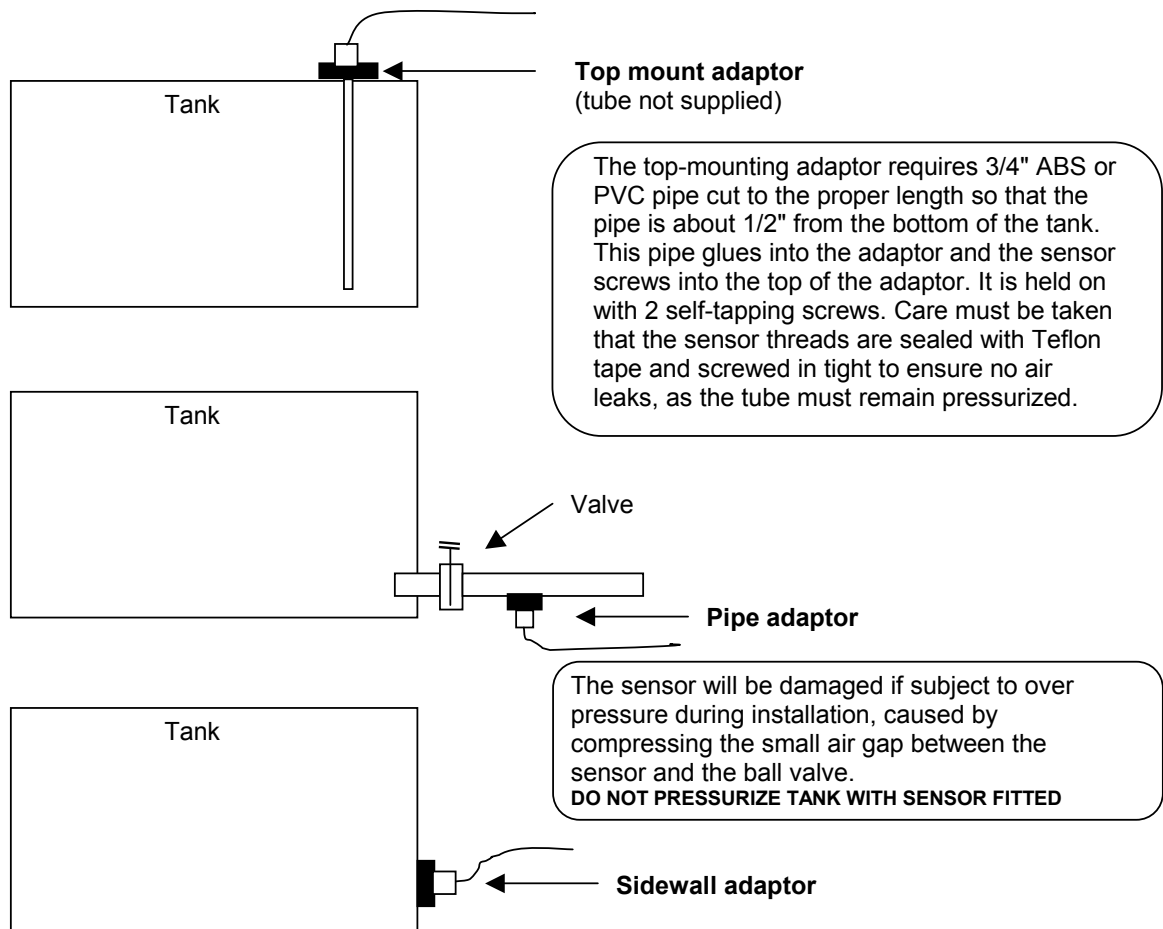
Mounting Adaptors Available:

A range of mounting adaptors are available which includes flat sidewall, top mount, 1.5" pipe, 2" pipe, 3" pipe and drain valve. **Ask your dealer for details**

Should a 4 to 20-milliamp loop sensor supplied by another manufacturer be used, then the adaptor (part number SM-420) will need to be installed.

Sensor Installation:

The sensor should be mounted as low in the sidewall as possible using a 3/4" spin-in **or** the flat sensor adapter. If the sensor adapter is used it will require drilling a 5/8" hole in the sidewall. Apply silicon glue liberally to the bottom of the adapter. Using #10 x 1/2" stainless steel self-tapping screws attach the adapter to the sidewall. Once the adapter is attached make sure that the hole in the adapter is clear of any excess glue. Allow drying as per the instructions for the glue. Wrap the threads of the sensor using Teflon plumbers tape and install the sensor. Tighten by hand. It is not recommended to install the sensor in the bottom of the tank. Although the sensor will operate correctly it will provide an area for debris to collect which would be difficult to flush out.



Sensor Programming Instructions

Two different methods of tank programming are available:

Method 1 sets tank low and tank high points which can only be used if the tank is a regular size and shape.

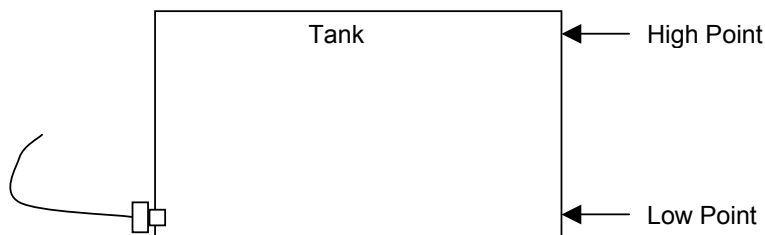
Method 2 sets tank low, tank quarter, tank half, tank three quarters and tank full points, offering more accuracy if the tank is an irregular size and shape.

Method 1:

Turn Rotary switch to position 0

Fill the tank to the required TANK LOW LEVEL; minimum suggested is liquid just covering the sensor. Wait for approx. 30 seconds for the fluid to settle. Press and hold down the program 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank low point. Fill the tank to the required TANK FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give three quick flashes, the tank high point will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch page 4)



Note: The Bottom only, Top only and Setting One System From Another only applies the HT-100 or HT-100P units with manufacture dates after March 2007.

The Bottom only setting can be done by turning the rotary switch to position A

Fill the tank to the required TANK LOW LEVEL minimum suggested is liquid just covering the sensor, wait approx. 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank low point. Push and release the program button, the LED will give three quick flashes, the tank low point will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch page 4)

The Top only setting can be done by turning the rotary switch to position B

Fill the tank to the required TANK FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank high point. Push and release the program button, the LED will give three quick flashes, the tank high point will be set and the unit will automatically leave program mode. The device is now ready for use.

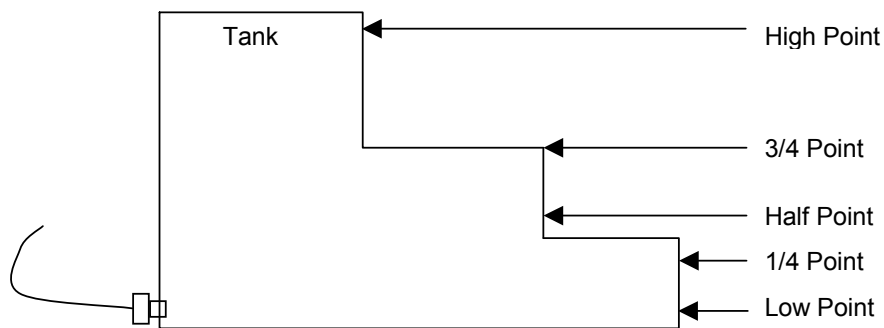
Turn Rotary switch to correct position (see Setting Rotary Switch page 4)

Method 2:

Turn Rotary switch to position F

Fill the tank to the required TANK LOW LEVEL, minimum suggested is liquid just covering the sensor. Wait for approx. 30 seconds for the fluid to settle. Press and hold down the program button (approx. 3 seconds) the LED will give four quick flashes and stay on, tank low point as now been set. Fill the tank to the required QUARTER LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give one quick flash, tank 1/4 point as now been set. Fill the tank to the required HALF LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give two quick flashes, tank 1/2 point as now been set. Fill the tank to the required THREE QUARTERS LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give three quick flashes, tank 3/4 point as now been set. Fill the tank to the required FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give four quick flashes and turn off, tank full point as now been set. All tank points will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch next page)



Setting One System From Another

Once one HT-100 or HT-100/P has been calibrated you can transmit the calibration settings from that unit to as many more as required (tanks would need to be the same).

The HT-100 can transmit or receive from or to HT-100/P and vice versa.

Note: This must be done independently from the complete system setup (only the two units connected) Connect the power and network cable to both units:

Step 1:

Turn the rotary switch to position C for the master transmitter (the unit that is calibrated).

Step 2:

Turn the rotary switch to position D for the slave receiver (the unit that needs calibrating).

You will see both LED'S flashing, please wait (approx 20 seconds) for the LED'S to stop flashing, the slave receiver now has the same calibration setting as the master transmitter.

For more information see "Calibration Tips & Tricks" on our web site www.smartswitch.co.nz

Setting Rotary Switch

Each Input/Output Unit: **HT-100 or HT-100/P** on the network must have the **Rotary Switch set to a unique number (from 2 to 5). NO two devices may share the same Rotary Switch number.**

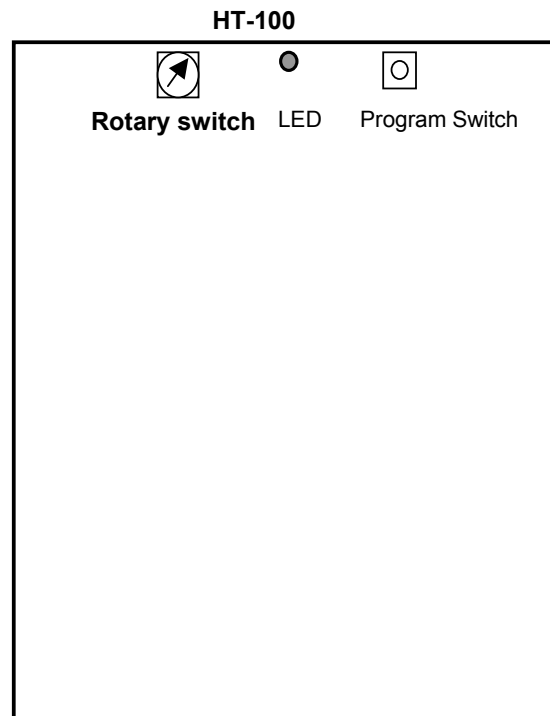
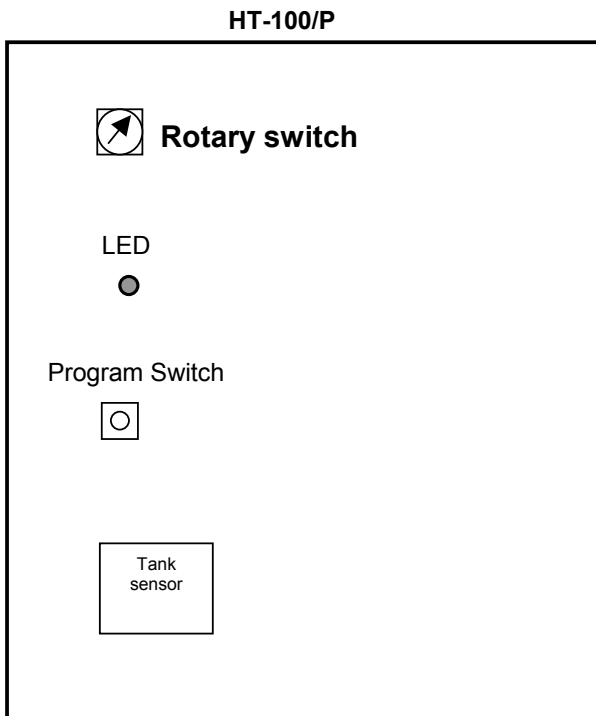
This Rotary Switch is situated inside the Box of the Input/Output Unit (see below for position).

For ease of reference please use the chart provided as this will enable quick reference when programming the Display Unit. See example below.

Table 1

Example

Switch #	Tank Position	Tank Type
2	<i>AFTPORT</i>	<i>GREY</i>
2		
3		
4		
5		



Programming Instructions:

Step 1: Placing the unit in Program Mode

Press and hold down the Backlight & Scroll keys together for three seconds. This will place the unit in program mode.

Step 2: Selecting the tank to program

Once the unit is in program mode the display will show “ Select Switch # ” use the Scroll or Backlight keys to change the switch number which corresponds to the I/O unit being programmed (refer to table 1 on page 11) for switch number.

Once the switch number has been selected push the Pump key.

Step 3: Program or Erase

The display will now show “ < Erase Prog > ” use the Scroll key to program or the Backlight key to erase. If the Scroll key is pushed go to step 4 if the Backlight key is pushed go to step 8.

Step 4: Selecting /Creating Tank Name

The display will now show

AFT
Select Position

Use the Scroll or Backlight key to scroll through the pre-named tank positions. Once you have found the text required or the text you would like to change, push the Pump key. If you want to choose the name on the display push the Pump key again this will take you to step 5. If you would like to change/create your own text name then use the Scroll key to scroll through the alphabet and the Backlight key to change to the next character. When finished push the Pump key this will take you to Step 5.

Step 5: Selecting Tank Type

Note: Tank Type is a NAME ONLY and sets the way the Alarm, Relay 1, Pump and Relay 2 behave and DOES NOT have to be set as the fluid in the tank.

Select the tank type that best suits the options you require.

Also See Relay 1, Relay 2 (page 13) and Pump Output (HT-100/P) & Alarm (page 14)

The display will now show

Grey Tank
Select Tank Type

Use the Scroll or Backlight key to scroll through the tank types. Once you have found the one required push the Pump key.

If the tank type **Grey or Black** is selected the display will now show “ Set Hi Point 8 ” use the Scroll or Backlight key to scroll through the tank levels 8 to 16. (8 = Half 16 = Full). Once you have selected the level push the Pump key. This sets the alarm and relay 1 trigger point.

If the tank type **Fresh or Fuel** is selected the display will now show “ Set Low Point 0 ” use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm and relay 1 trigger point.

If the tank type **Water Maker (Man or Auto)** is selected the display will now show “ Set Low Point 0 ” use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm trigger point ONLY. Relay1 will turn ON at tank full and OFF at 3 bars less than full.

If the tank type **Motor-Home Water** is selected the display will now show “ Set Low Point 0 “ use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm trigger point. (If a HT-100/P is connected Relay1 will turn ON at this trigger point and OFF at 1 bar greater than this trigger point. Also see details under HT-100 and HT-100/P sections.

Step 6: Tank Volume (see Note 1 page 6)

The screen will now display “Do you want to set Tank Volume”. This allows for displaying the tank volume in either Liters or Gallons. If this feature is required push Scroll. Push the Backlight key for Liters or the Scroll key for Gallons.

The display will now show “ Set Vol 00000”. Use the Scroll and Backlight keys to scroll up and down numbers and the Pump key to enter and move to the next digit. . When the last digit is reached and the Pump key is push you will go to step 7.

Step 7: Next or End

The display will now show “ < End Next > ” push the Scroll key to program the next I/O unit which will return you back to Step 3 or push the Backlight key to exit from program mode.

Step 8: Erase Tanks

The display will now show “ Are U Sure < Y N > “ push the Scroll key for NO or the Backlight key for YES. If NO is selected the unit will return back to Step 2 if YES is selected the Tank Position and Type will be erased for that switch position and the unit will return you back to Step 7.

Relay's:

The output relay 1 & relay 2 are a 3-amp inductive load relay with common, normally open and normally closed contacts available.

HT-100 (relay 1 & alarm)

Tank type set as Grey or Black

When the tank reaches the programmed high-level point (see Step 5 above) the alarm and relay 1 will turn ON, and OFF two display bars below full. This output could be used to disable the toilet controller or activate a tank full warning light/alarm. Pushing the Mute key will mute the alarm.

Tank type set as Fresh or Fuel

When the tank reaches the programmed low-level point (see Step 5 above) the alarm and relay 1 will turn ON, and will turn OFF when the tank has been filled by two bars above the programmed low-level. Pushing the Mute key will mute the alarm.

Tank type set as Water-Maker (Man or Auto)

When the tank reaches the programmed low-level point (see Step 5 above) the alarm will turn ON. Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm.

Tank type set as Motor-Home Water

Pushing the Pump On/Off button at any time will activate relay 1, which will turn OFF automatically when the programmed low-level point is reached or it can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

HT-100/P (pump output, relay 2, relay 1 & alarm)

Grey or Black Tank

If the tank is programmed as either Grey or Black and the tank reaches the programmed high-level point (see Step 5 above) the audio alarm and relay 1 will turn ON indicating a full tank, and OFF two display bars below full. Pushing the Pump On/Off button will activate the pump and relay 2, which will turn OFF automatically when the tank reaches empty or it can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

Fuel Tank

If the tank is programmed as Fuel the pump output and relay 2 will automatically turn ON when the tank reaches the programmed low-level point (see Step 5 above) and OFF when full, alternatively pushing the Pump On/Off button any time will activate the pump, which will turn OFF automatically when the tank reaches full or it can be turned OFF at any time by pushing the Pump On/Off button again. The alarm and relay 1 will turn ON when the tank goes below the programmed low-level value and will turn OFF when the tank is two bars above the programmed low-level. Pushing the Mute key will mute the alarm.

Fresh Tank

If the tank is programmed as Fresh the audio alarm and relay 1 will turn ON when the tank reaches the programmed low-level point (see Step 5 above) to indicate the tank is low and will turn OFF when the tank is two bars above the programmed low-level. Pushing the Pump On/Off button any time will activate the pump and relay 2, which will both turn OFF automatically when the tank reaches full or the pump and relay 2 can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

Water-Maker Man

If the tank is programmed as Water-Maker Man the audio alarm will turn ON when the tank reaches the programmed low-level point (see Step 5 above) to indicate the tank is low and OFF two display bars above the programmed low-level point. If connected to a water maker pushing the Pump On/Off button any time will activate the pump and relay 2, which will both turn OFF automatically when the tank reaches full. The pump and relay 2 can be turned off at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm.

Water-Maker Auto

If the tank is programmed as Water-Maker Auto the pump output and relay 2 will automatically turn ON when the tank reaches the programmed low-level point (see Step 5 above) and OFF when full, alternatively pushing the Pump On/Off button any time will activate the pump output and relay 2, which will turn OFF automatically when the tank reaches full or it can be turned OFF at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm. This setting could be used for land based systems.

Motor-Home Water

If the tank is programmed as Motor-Home Water pushing the Pump On/Off button at any time will activate the pump output and relay 2, which will turn OFF automatically when the programmed low-level point is reached or it can be turned OFF at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the programmed low-level point is reached and OFF one display bar above the programmed low-level point. Pushing the Mute key will mute the alarm.

Operating Instructions:

1/ Pushing the Backlight key will turn the backlight ON, push again to turn OFF.

2/ Pushing the Pump key will turn the pump ON, push again to turn OFF. The Pump key will also act as the Mute key if an alarm is on. e.g. if the alarm is ON the first push will mute the alarm the second push the turn the pump ON.

3/ Push and hold the Scroll for 4 seconds to change display modes (repeat to change back).

Pushing the Scroll key will change to the next tank on the system. If a pump is turned ON a "P" will be displayed in the top right section of the display. If the Scroll key is then pushed to display another tank the "P" will flash indicating there is a pump ON somewhere but it's not the tank you are looking at. If the Scroll key is pushed until the tank with the pump ON is reached the "P" will stay on solid. If the seacock interlock switch is fitted and the valve is closed the pump will not turn ON and a "V" will be displayed instead of the "P" and the audio alarm will sound (push the Pump button to mute). If the Scroll key is then pushed to display another tank the "V" will flash indicating there is a valve closed somewhere but it's not the tank you are looking at. Once the valve is opened the "V" will change to a "P" pushing the Pump button again will turn the pump ON. The Tank Select is non-volatile therefore the last tank displayed will be remembered and displayed on next system restart.

Audio Alarm:

The audio alarm can be turned ON or OFF by holding down the Backlight button for three seconds, you will hear a bleep after every second. After three bleeps you may release the button, if the alarm is ON a small bell icon will appear on the top left corner of the display, if the alarm is OFF the small bell icon will disappear. The bell icon will flash when the tank with the alarm is scrolled to.

Errors:

If the HT-100 or HT-100/P loses communication or power the text "COMMS FAULT" will be displayed on the bottom line (tank level bar-graph) of the TM-4000 display unit. The display will resume normal operation once the problem has been rectified.

TM-4000 Mounting

“ Warning ”

If the display unit is being installed in an area where it may experience moisture or wetting, please ensure a bead of silicon is placed behind the unit to prevent water entering via the connection cable.

